Olympic Coast
National Marine Sanctuary

2002 Contract
Side Scan Sonar Survey
Element I

Procurement Request ncnd6026-2-00031

Internal Report
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1 INTRODUCTION

A side scan sonar survey was contracted to Search, Salvage, and Rescue, Inc. (SSR Inc.) during the summer of 2002. This report summarizes survey efforts and preliminary processing results and provides an overview of the surficial geology and lithology of the seafloor in a selected area within the Olympic Coast national marine sanctuary (OCNMS).

1.1 AREA SURVEYED

An area within the general vicinity of the Juan de Fuca Canyon, bounded by coordinates 48N 20'6",125W 9'0", 48N 4'25" 124W 53'23", was surveyed from September 20 - September 25, 2002. Depth of the project area ranged from 120-350 meters. Sea state was excellent for the duration of the project with minimal wind and swells ranging from 0'-2' to 6'-8'.

2 DATA ACQUISITION

2.1 VESSEL

The 168' fishing vessel Mystery Bay was used as the survey platform (Figure 1) using the aft hydraulic crane as a tow point for attaching the sheave block.

Figure 1. F/V Mystery Bay.

The crane was positioned to the stern as to position the towfish directly behind the vessel during survey operations (Figure 2).

Figure 2. Attachment of the towfish prior to moving the crane to the stern.

2.2 EQUIPMENT AND PROCEDURES

2.2.1 Positioning and General Acquisition Assembly

A trimble DSM 212H differential GPS (DGPS) beacon was provided by SSR to acquire primary ship positioning. A Trackpoint II ultrashort baseline (USBL) system (calibrated on site) was also provided by SSR, and was logged as the primary source of positioning for the towfish. A transponder was bolted to a 20' pole (Figure 3) which was mounted on the starboard side of the vessel (Figure 4).

The transceiver was affixed to the cable just above the towfish attachment point. A digital cable counter mounted on a traction winch provided backup positioning to the USBL system. Cable out data permitted calculation of towfish layback by using depth data collected from a pressure sensor mounted inside the towfish.

A hydraulic pump unit (HPU), acquired from Fugro Seafloor Systems, was mounted on the deck (Figure 5) to power the traction winch (Figure 6), which provided the primary force for manipulating cable. The HPU also powered the main cable drum to manage cable (Figure 7).

Figure 3. Pole mounted transponder (in transit position). Pole rotated vertically during survey.

Figure 4. Bracket welded to deck for securing transponder pole.

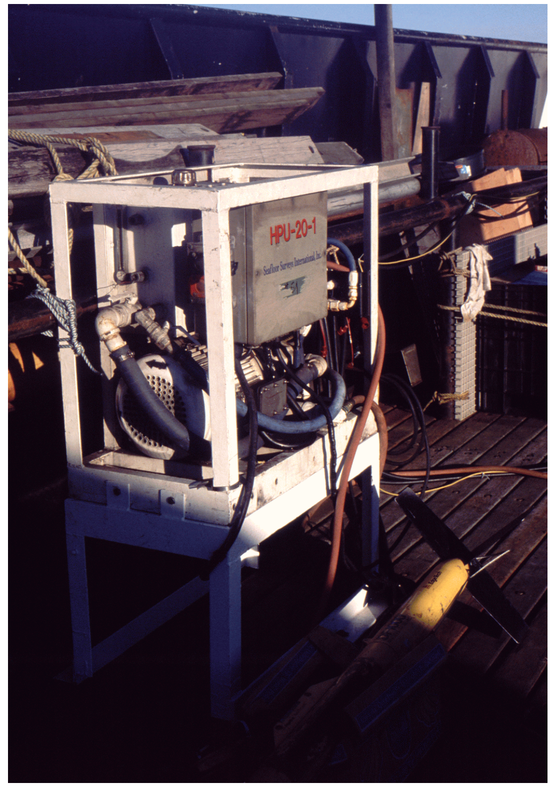

Figure 5. Hydraulic pump unit for powering winch assembly.

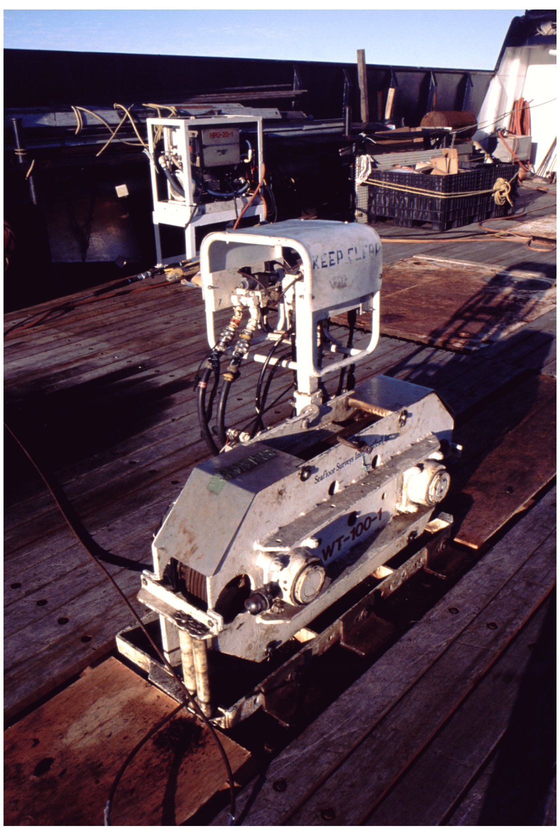

Figure 6. Traction winch with HPU in background.

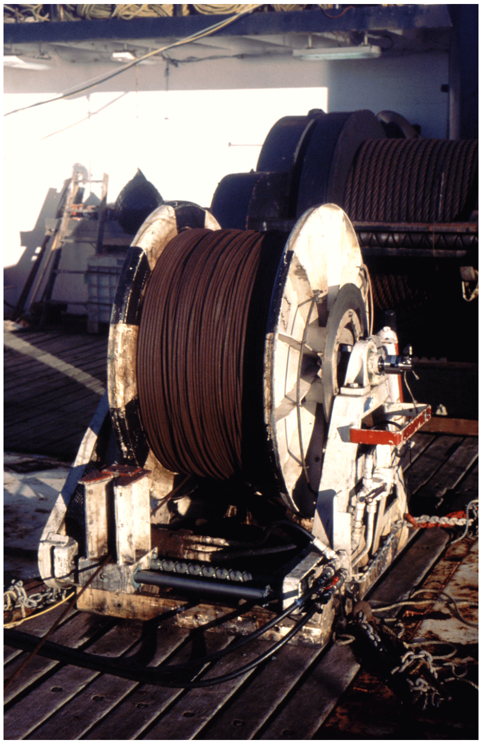

Figure 7. Cable drum with level wind.

2.2.1.1 Project Datum

Positional information supplied by DGPS was in the WGS84 datum (Table 1) and all online survey was conducted using this datum. Data sets were projected to the universal transverse mercator (UTM) Zone 10 North projection (Table 2) for mapping and display.

Table 1. Datum Parameters

Datum	WGS84
Spheroid	WGS84
Semi-major axis	6378137.000
Semi-minor axis	6356752.314
Inverse flattening (1/f)	298.2572236
Eccentricity squared (e^2)	0.006694380

Table 2. Projection Parameters

Projection	Universal Transverse Mercator (UTM)
Zone	10 North
Unit	Meter
Latitude of Origin	0
Central Meridian (CM)	123 W
False Easting	500,000
False Northing	10,000,000
Scale Factor at CM	0.9996

2.3 SIDE SCAN SONAR AND DATA LOGGING

An Edgetech DF1000 dual-frequency sonar (Figure 8) was used to acquire the imagery. This system has an horizontal beam width of 1.2° at 100Khz and 0.5° at 500Khz. A vertical beam width of 50° with a 20° depression angle was set on the transducers. A survey speed of 3-3.5 knots was targeted during survey operations. However, due to relatively slow winch drum speed, vessel speed jumps of up to 12 knots were occasionally required to avoid contacting the towfish with the canyon head.

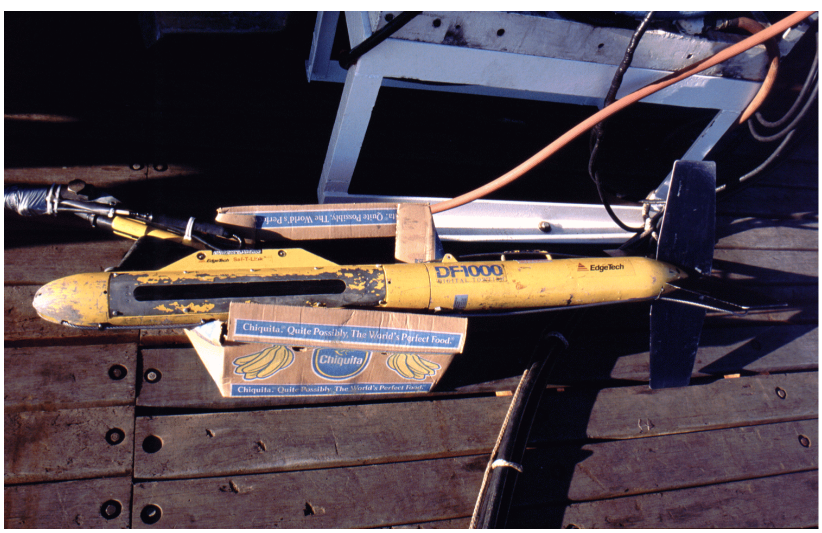

Figure 8. Edgetech DF1000 digital towfish.

Navigation from the Trimble DGPS, corrected towfish position from Trackpoint II, and ship's gyro were all logged into Hypack version 005b (Coastal Oceanographics). ISIS Sonar (Triton Elics International) was used to log the digital cable data and signals from the DCU (Figure 9).

Figure 9. DCU for controlling towfish settings (left), Hypack monitor (middle) on top of 3 UPS devices, and the Isis PC and monitor (right). White unit under the DCU is the trackpoint II controller.

The primary navigation data (Trackpoint II) and the auxiliary navigation (ship position) were patched into ISIS through the shared memory option in Hypack (Figure 10). All times were referenced to Pacific Standard Time.

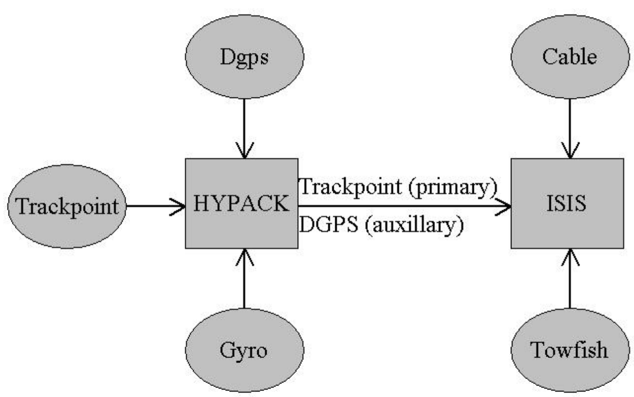

Figure 10. Schematic of the data acquisition configuration setup for the F/V Mystery Bay.

Towfish settings were initially configured to a 150m range scale using a 250m line spacing plan. To maximize the amount of sea floor surveyed, a further refinement of the range scale was made by switching to 300m and increasing the line spacing to 500m. Data were logged in ISIS in the XTF format. Cursory data processing was done simultaneously to acquisition for quality assurance and control using Caris Hips version 5.2 (Universal Systems Ltd.).

3 DATA PROCESSING

3.1 IMAGE PROCESSING

Final image mosaics were created using TEIs's ISIS Sonar. Excessive noise from the Trackpoint II system precluded the primary position from being used to create the mosaics. TEI's ModXTF utility was used to swap the primary and auxiliary positioning within the XTF files. Thus the auxiliary positioning was used to calculate a layback position from the logged cable out data in conjunction with depth information provided by the pressure sensor within the towfish. The navigation data was smoothed in ISIS Sonar using a 5 point moving average option. Mosaics were imported into TEI's DelphMap where a reverse palette scale was applied before exporting to geotiff format. The mosaiced tiff image was converted to raw binary format in Erdas Imagine to remove header information from the tiff image thereby leaving a basic binary file containing only grey-scale intensities.

3.2 TEXTURE ANALYSIS

Several studies (Skohr 1991; Blondel 1996) have found the use of grey level alone for assigning classification codes to side scan sonar imagery as being inadequate. Thus a co-occurrence matrix approach was instead used as a preferred alternative for classifying the imagery since it has been found to more effectively assess the spatial relationship of pixel intensities from remote sensing data (Haralick 1973; Blondel 1996). An image classification routine was performed on the mosaiced 1m image through the use of an automated image analysis routine using entropy and homogeneity textural indices (Cochrane and Lafferty 2002). Other studies (Blondel 1996) have successfully used various indices to effectively classify side scan sonar data, however these two indices were specifically chosen for texturally classifying the imagery from this survey.

Binary code for the texture analysis procedure was obtained from the USGS (Cochrane and Lafferty 2002) and compiled in Linux Mandrake 9.2 at OCNMS. The initial procedure involved implementing *TexScal* which calculates the range of values for entropy and homogeneity and assigns correction values to rescale floating point values to 8-bit numbers within a range of 0-255. *TexGen* was then executed to create the entropy and homogeneity textural index images. *TexGen* accepts both the range and scaling factors for the homogeneity and entropy indexes that were calculated during the *TexScal* procedure. Textural signatures were then selected for training the classification program by using Erdas Imagine to interactively locate individual signatures for each of the classes. Map coordinates for pixels from a 10x10 bounding box for each of the training signatures were entered into

TexSig. *TexSig* uses the map coordinates to locate the grey scale values at each pixel location from the entropy, homogeneity, and side scan images to create the final classification signatures for input into *TexClass*. *TexClass* uses the signatures files created by *TexSig* to create a thematic grey scale image from the three continuous grey scale images (homogeneity index, entropy index, and the raw side scan image) which represents the final classified image. This procedure was run four separate times to create individual classification images for each class (sand_silt_clay, fine_mixed_sediment, coarse_mixed_sediment, and rock_boulder) that were visually observed in the side scan imagery. Adobe Photoshop was used to visually remove data that was determined to be misclassified or to remove null data for each class. The mosaic feature in Erdas Imagine was then used to merge the four edited thematic images into one final image which was then exported to TIF format. The MajorityFilter command (EIGHT|HALF) was used in ArcInfo to reduce the number of raster features through a neighborhood analysis. The tiff image was converted to Arc format through a raster to polygon conversion.

4 SURVEY EFFORT RESULTS

Over 573 linear km of tracklines, covering an area of approximately 267 km^2 (77.9 nm^2) were surveyed over the course of the five day project (Figures 11 and 12)..

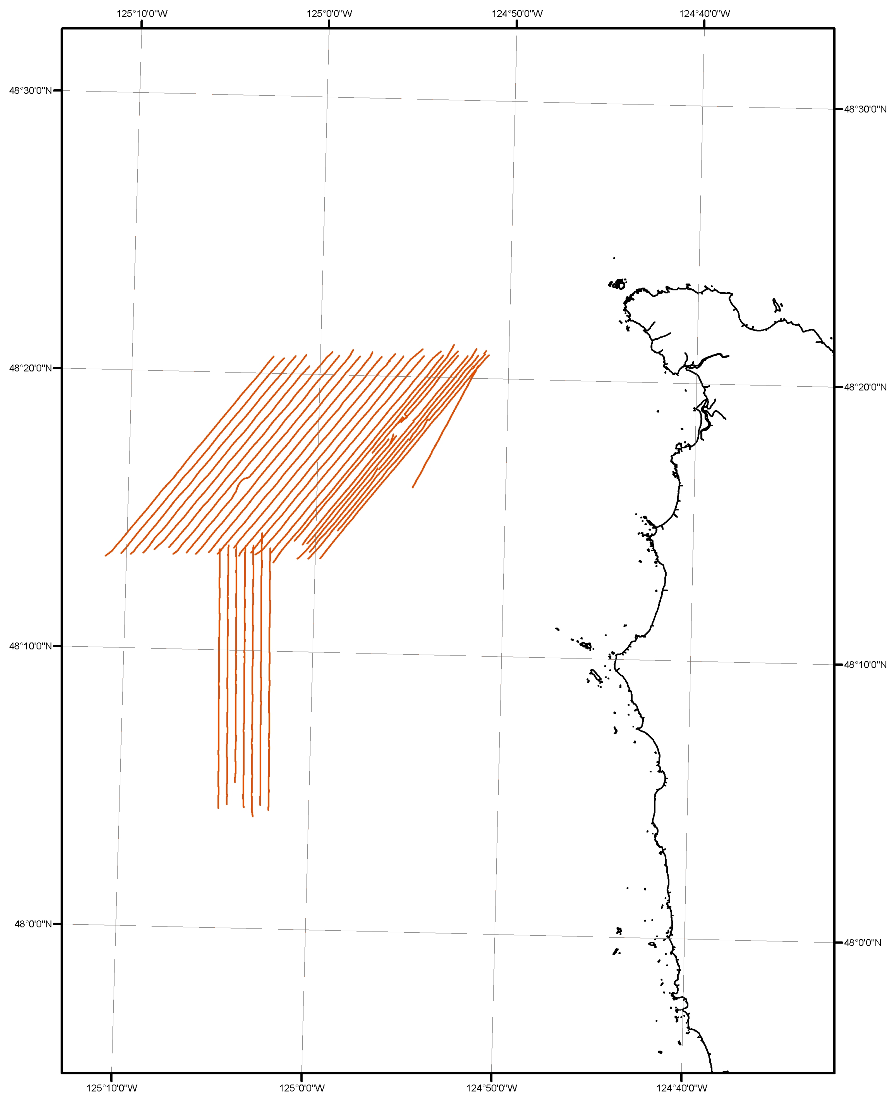

Figure 11. Large scale (1:300,000) map of the F/V Mystery Bay survey lines.

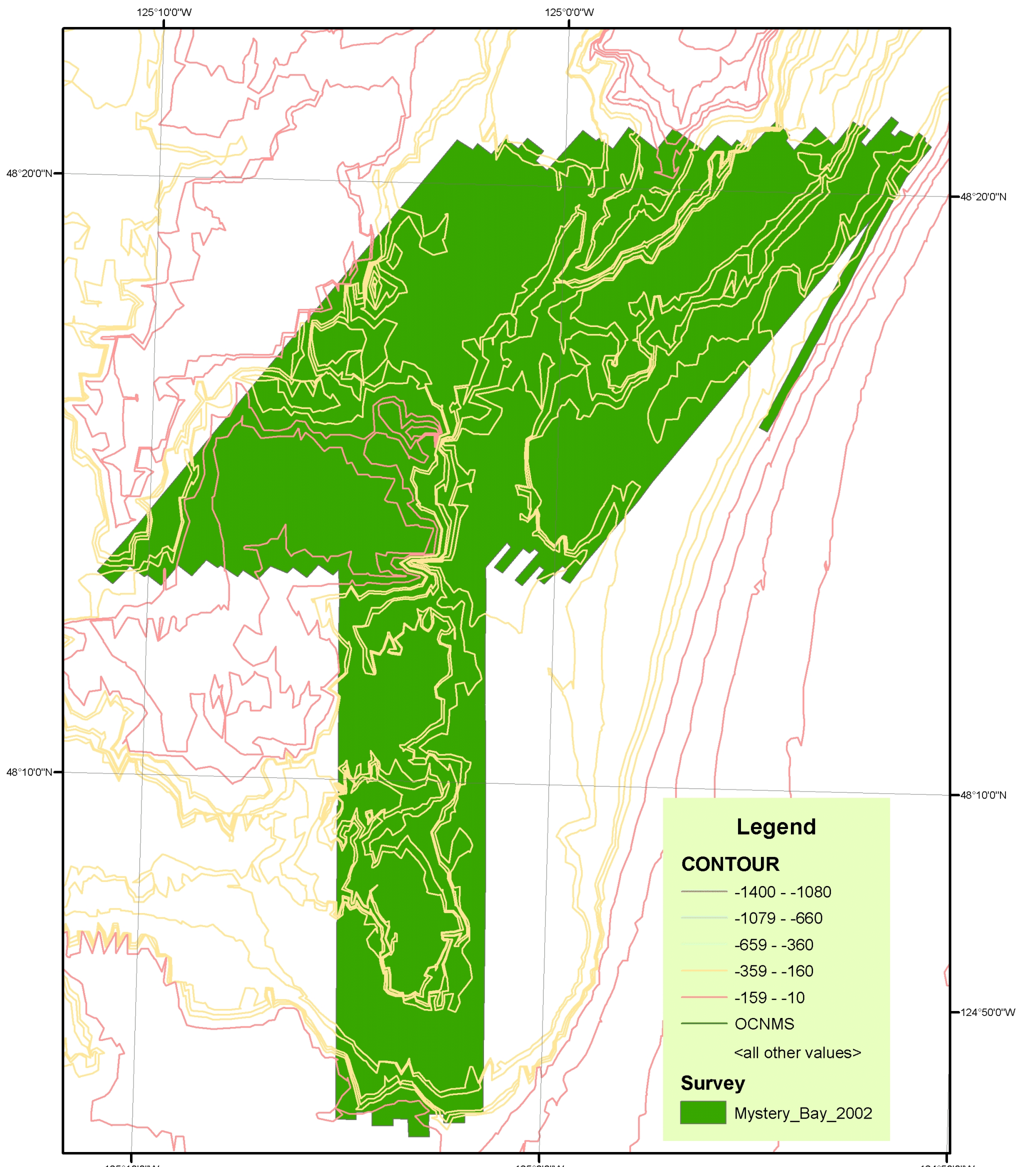

Figure 12. Medium scale (1:150,000) map of the F/V Mystery Bay survey area, with bathymetry (m).

4.1 SIDE SCAN SONAR INTERPRETATION

Examination of the backscatter revealed a seafloor consisting mostly of soft sediments such as a sand, silt, mud consistency (Table 3). These sediments cover over 37 percent of the seafloor within the survey area. Scattered areas of mixed pebble and cobble with boulders were also identified throughout the area. Several small hard returns were also noted which were categorized as rock. A few rock outcroppings of significant size were also noted. Figure 13 provides a spatial representation of the bottom type classification presented in Table 3.

Table 3. Estimated total area (km2) of bottom types classified within the F/V Mystery Bay survey area.

Sediment	Count	Area (km^2)
No_Data	628	<1.0
Sand_Silt_Clay	255884	37.0
Fine_Mixed_Sediment (mud_gravel_pebble)	132996	2.3
Coarse_Mixed_Sediment (pebble_cobble_boulder)	35939	35.6
Rock	7813	<1.0

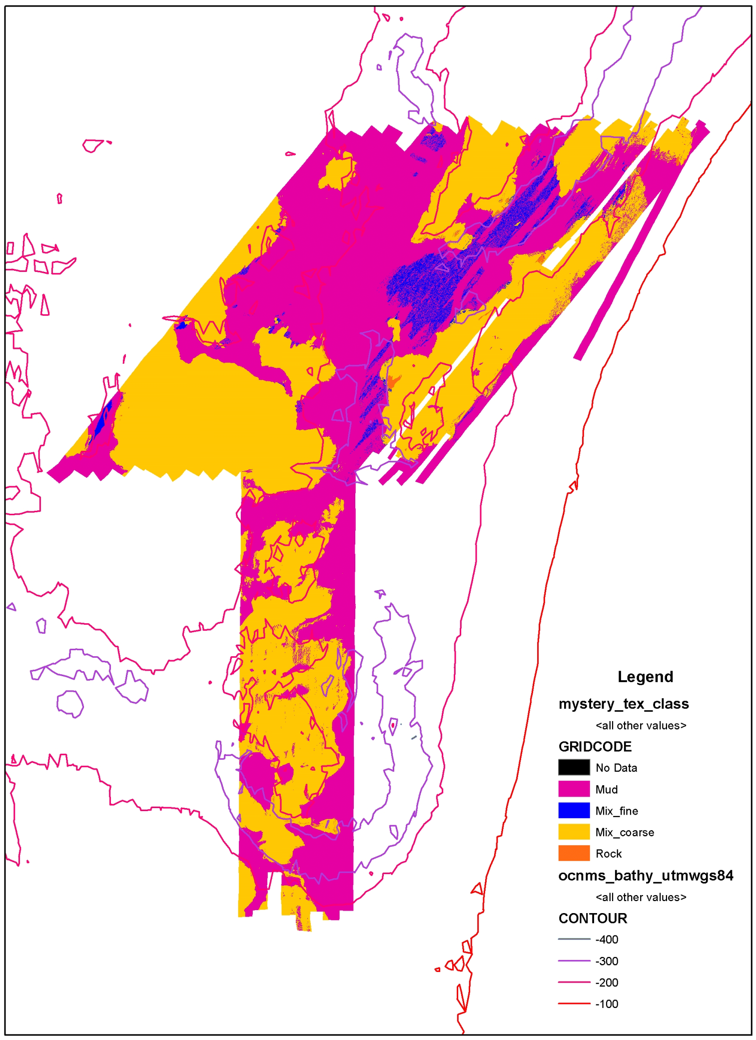

Figure 13. Classification of side scan sonar data collected onboard the F/V Mystery Bay. Contour units are meters.

Video observations from an ROV survey conducted during June 2004, grab samples collected from the same survey, and the US Seabed database (Reid et al 2001) were used to assist with sonar interpretation and validation. The extent of these groundtruthing efforts is illustrated in Figure 14.

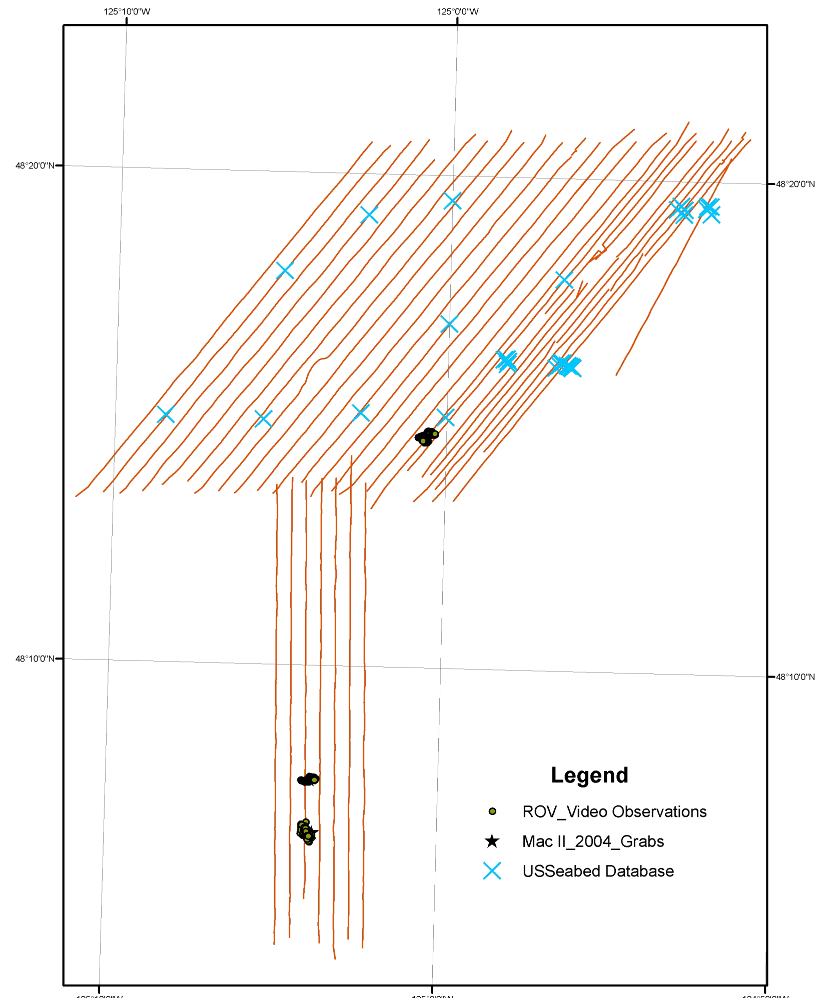

Figure 14. Existing groundtruthing data for the survey area.

Optimally, several areas within the survey bounds should be subjected to further groundtruthing (Table 4) scrutiny. These areas were prioritized in the event that all sites may not be groundtruthed due to time or resource constraints. Prioritization was based on degree of certainty in the interpretation (high priority = low certainty), and the need for representative sampling throughout the survey area. A geographical representation of these locations is presented in Figure 16.

Table 4. Coordinates for areas needing ground truthng effort (ID=geodatabase code).

ID	Priority	Feature	Latitude	Longitude
0	1	Rock_Pinnacle	48.243163	-125.010493
1	1	Unidentified_Feature	48.336316	-125.049617
2	1	Unidentified_Rock_Outcrop	48.109195	-125.064630
3	2	Unidentified_Rock_Outcrop	48.085984	-125.056662
4	2	Unidentified_Rock_Outcrop	48.208948	-125.077189
5	1	Unidentified_Rock_Outcrop	48.220825	-125.069401
6	1	Sedimentary_Rock_Outcrop	48.215813	-125.069957
7	1	Unidentified_Rock_Outcrop	48.244171	-124.984075
8	1	Unidentified_Rock_Outcrop	48.259296	-125.011593
9	1	Unidentified_Rock_Outcrop	48.259169	-125.009219
10	1	Unidentified_Rock_Outcrop	48.308419	-124.988766
11	1	Unidentified_Rock_Outcrop	48.265540	-125.045932
12	1	Unidentified_Rock_Outcrop	48.311645	-124.901759
13	1	Sand_Silt_Clay	48.284904	-125.027808
14	1	Sand_Silt_Clay	48.177000	-125.072970
15	2	Sand_Silt_Clay	48.326986	-124.912498
16	2	Sand_Silt_Clay	48.291792	-125.086199
17	2	Sand_Silt_Clay	48.249201	-125.101623
18	1	Sedimentary_Rock_Outcrop	48.309173	-124.979953

Table 4 continued. Coordinates for areas needing ground truthng effort (ID=geodatabase code).

ID	Priority	Feature	Latitude	Longitude
19	2	Sedimentary_Rock_Outcrop	48.134033	-125.050960
20	1	Sedimentary_Rock_Outcrop	48.242951	-125.151238
21	1	Sedimentary_Rock_Outcrop	48.310598	-124.897607
22	1	Sedimentary_Rock_Outcrop	48.333010	-125.043701
23	1	Sedimentary_Rock_Outcrop	48.264468	-125.018138
24	1	Sedimentary_Rock_Outcrop	48.322010	-124.888058
25	1	Sedimentary_Rock_Outcrop	48.127193	-125.062682
26	1	Sedimentary_Rock_Outcrop	48.141988	-125.064137
27	1	Sedimentary_Rock_Outcrop	48.144054	-125.056311
28	1	Sedimentary_Rock_Outcrop	48.148146	-125.048133
29	2	Sedimentary_Rock_Outcrop	48.161413	-125.048949
30	1	Sedimentary_Rock_Outcrop	48.163540	-125.075217
31	2	Sedimentary_Rock_Outcrop	48.151266	-125.083351
32	1	Sedimentary_Rock_Outcrop	48.131946	-125.075377
33	1	Sedimentary_Rock_Outcrop	48.267492	-125.072121
34	1	Sedimentary_Rock_Outcrop	48.231201	-125.060050
35	1	Sedimentary_Rock_Outcrop	48.223927	-125.081406
36	1	Wreck_Feature	48.265006	-125.013481

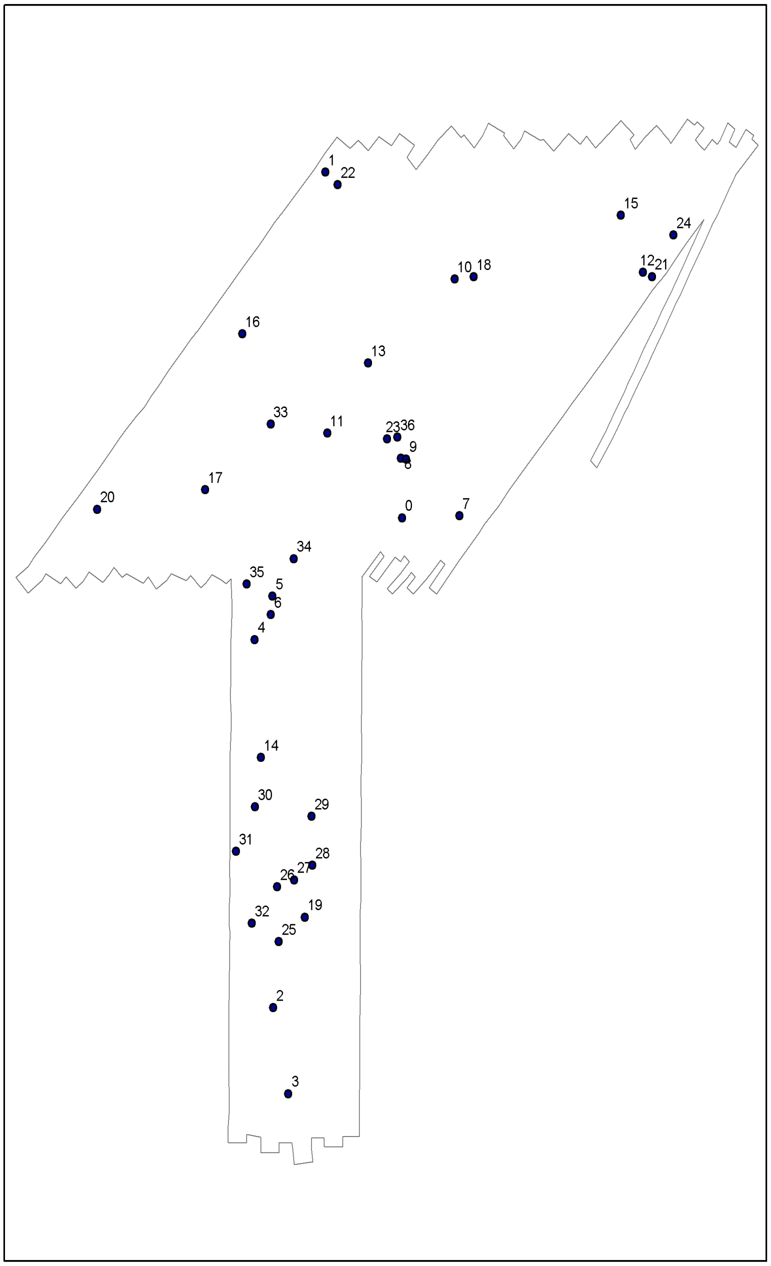

Figure 15. Locations for further groundtruthing efforts.

Various technical difficulties were encountered during the survey; however those impediments were not considered to be out of the ordinary. The cruise was determined to be a success by providing a significant contribution to the overall OCNMS habitat mapping initiative and by contributing useful information describing the lithological structure of the seafloor within a selected region of the sanctuary.

Results from the survey were consistent with two other side scan surveys recently conducted in adjacent areas. In September 2002, a USGS led survey (Cochrane et al, in progress) operating on the nearshore shelf directly shoreward of the 2002 F/V Mystery Bay survey lines revealed a seafloor entirely consisting of modern holocene age sand. This observation was consistent with the first survey line that was run on the F/V Mystery Bay, which ultimately led to the decision of changing line plans to locate more interesting bottom features. An older tertiary period rock outcropping feature revealed during a July 2002 cruise aboard the Navy YP class vessel (Fletcher 2000) was also confirmed on this survey. Even though the results of the side scan imagery obtained from the year 2000 YP survey were less than desirable, results from that survey also indicated that modern age soft sediments predominate the seafloor on the shoreward boundary of the F/V Mystery Bay survey lines, along with the same miocene age outcropping of oceanic bedrock that was selected as a starting point for the planned lines of this survey.

In sum, the survey area primarily consists of holocene age sand and silt sediments from the quarternary period that are likely deposits from the Puget Sound and Columbia River (Nittrouer 1978; Sternberg 1986). A few exposed areas of oceanic bedrock, possible metamorphic rock, and several anticlines of miocene age sedimentary rock were also potentially identified. These features are caused by extreme folding and faulting and differential erosion in response to the active tectonic forces that are occurring throughout this region (McCrory 1996; Twichell et al 2000). Areas of softer sediment are also present, and are likely of glacial origin (Venkatarathnam and McManus 1973) originating in the Olympic Mountains. Again, this interpretation should be subjected to further scrutiny of groundtruthing to verify these assumptions.

The identified rock features would provide adequate habitat for many of the ground fishes inhabiting this region of the coastline (NMFS 2003).

5 ACKNOWLEDGMENTS

Special thanks to John Tamplin, Seafloor Systems, for gratefully loaning a Triton Elics dongle to permit in-house processing of the side scan imagery.

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7 APPENDIX

7.1 DAILY LOG OF EVENTS

Thursday, September 19th 2002-
Mystery Bay arrived in Port Angeles at 0745. Major mobilzation occurred. Underway for Sanctuary at 2200.

Friday, September 20th 2002-
Onsite at 0630. Tested gear and continued more configuation. Bad DCU, not getting depth data from pressure sensor in fish. Replaced DCU.. Started first line at 0930. Range scale set to 150m. Line spacing 250m.

Line#	Azimuth	Time(SOL)	Time(EOL)	Hypack File	Isis File
1	208	1039	1216	001_1040.raw	line1.xtf

changed line plan since all soft sediment with no features. Moved west toward feature.

Line#	Azimuth	Time(SOL)	Time(EOL)	Hypack File	Isis File
1a	39	1409	1633	001_1409.raw	line1a.xtf
2a_1	219	1811	?	002_1811.raw	line2a_1.xtf
2a_2	219	?	?	?	line2a_2.xtf
2a_3	219	?	2054	?	line2a_3.xtf
3a_1	39	2141	?	003_2141.raw	line3a_1.xtf
3a_2	39	?	2359	?	line3a_2.xtf

Saturday, September 21th 2002-

Line#	Azimuth	Time(SOL)	Time(EOL)	Hypack File	Isis File
4a_1	219	0106	?	004_0106.raw	line4a_1.xtf
4a_2	219	?	0336	?	line4a_2.xtf
5a_1	39	0427	?	?	line5a_1.xtf
5a_2	39	?		0638	? line5a_2.xtf
6a_1	219	0716	?	006_0716.raw	line6a_1.xtf
6a_2	219	?	0929	006_0816.raw	line6a_2.xtf
7a_1	39	1001	?	007_1001.raw	line7a_1.xtf
7a_2	39	?	1232	?	line7a_2.xtf

Noticed that date template in Isis was set up wrong. Month and day fields were switched. Isis files up to this point were dated either 9/5/2020 or 9/6/2020. Template was corrected.

Line#	Azimuth	Time(SOL)	Time(EOL)	Hypack File	Isis File
8a_1	219	1319	?	008_1319.raw	line8a_1.xtf
8a_2	219	?	1606	?	line8a_2.xtf

At 1645 we noticed the hard drive on Isis was running out of space. Then attempted to transfer *.XTF data to CDROM to open space, but the CD writer had no host adapter therefore it was recognized as having writing capabilities. We tried to create a network connection to transfer data over an ethernet connector but the Isis box had no network adaptors setup. Now tried to install new network card, but Isis wanted Windows 95 discs for install for which were not on hand. At this point we tried to have windows skip the installation of certain files which led to a system crash. Now arranged for the R/V Tatoosh to bring CD writing application with hopes of getting the cd writer to work. Received the software, but installation did not work. Now tried to use a backup Elac box that Tamplin sent to network into it or take the hard drives out but the box would not boot. Meanwhile we arranged for John Tamplin to bring another backup Isis box (after much hassle!) with Windows 2000, in addition to the windows 95 installation discs. At 1730 the survey was temporarily put on hold while we anchored outside of Neah Bay awaiting replacements. Tamplin left equipment with Thales Geosolutions party chief who was coincidentally conducting a side scan/multibeam survey in Makah Bay for the Aqua Energy project.

Sunday, September 22th 2002-

Marcus Ballweather, owner of F/V Quicksilver and contract vessel for Thales, dropped the equipment off to us the following morning at 0830. Began reconfiguration while steaming back on site. Problems were encountered reconfiguring system for setup with Windows 2000. Had trouble getting cable counter data to input into Isis. Ended up changed the parity from none to even thus fixing the problem. Resumed the survey at 1400, after roughly 22 hours of down time. SSR agreed to compensate for time down.

Line#	Azimuth	Time(SOL)	Time(EOL)	Hypack File	Isis File
9	219	1400	1504	009_1504.raw	009_1504.xtf

Hit an unknown object in the water column and lost the tail fins on the towfish. Had to retrieve fish and replace fins. Finally able to look at data. Noted that trackpoint was very noisy. Decided that terrain was not good for trackpoint due to much relief. Angle of incidence between transponder and transceiver is too great. Continued to attempt to pull first two days data off of the Windows 95 Isis box using networking techniques. Difficulties getting Windows 95 to locate the appropriate drivers.

Line#	Azimuth	Time(SOL)	Time(EOL)	Hypack File	Isis File
10	39	2007	2239	010_2007.raw	010_2007.xtf

Decided to bump up the range scale to 300m and increase the line spacing to decrease overlap in order to cover more area. Now skipping every other line (using the same line plan) such that there is a 500 m line spacing.

Line#	Azimuth	Time(SOL)	Time(EOL)	Hypack File	Isis File
12	219	2331	?	012_2331.raw	012_2331.xtf

Monday, September 23th 2002-

Line#	Azimuth	Time(SOL)	Time(EOL)	Hypack File	Isis File
14	39	0347		014_0347.raw	014_0347.xtf

Chain slipped off sprocket on level wind causing a jam in the traction winch. Had to increase vessel speed and search for deep water to avoid crashing fish while solved the problem.

Line#	Azimuth	Time(SOL)	Time(EOL)	Hypack File	Isis File
16	219	0707	0929	016_0707.raw	016_0707.xtf
18	39	0954	1233	018_0954.raw	018_0954.xtf

Changed line spacing to 550m to maximize coverage, keeping the 300m range scale setting.

Line#	Azimuth	Time(SOL)	Time(EOL)	Hypack File	Isis File
2	219	1333	1341	002_1333.raw	002_1333.xtf
	Hypack crashed		1342	002_1342.raw	002_1342.xtf
3	39	1637	?	003_1637.raw	003_1637.xtf

Line#	Azimuth	Time(SOL)	Time(EOL)	Hypack File	Isis File
4	219	1930	2142	004_1930.raw	004_1930.xtf
5	39	2203	0026	005_2203.raw	005_2203.xtf

Tuesday, September 24th 2002-

Line#	Azimuth	Time(SOL)	Time(EOL)	Hypack File	Isis File
6	219	0100	?	006_001.raw	006_001.xtf
Ship's autopilot kicked off and boat drifted off course from 0234-0339.					
7	39	0349	0621	007_0349.raw	007_0349.xtf
8	219	0648	0900	008_0648.raw	008_0648.xtf
	Hypack crashed.	0908	0911		
9	39	0924	?	009_0924.raw	009_0924.xtf
10	219	1215	1438	010_1215.raw	010_1215.xtf
11	39	1503	1757	011_1503.raw	011_1503.xtf
12	219	1820	2028	012_1820.raw	012_1820.xtf
13	39	2057	2326	013_2057.raw	013_2057.xtf

Changed survey area in a souther direction. Created another line plan.

Wednesday, September 25th 2002-

Line#	Azimuth	Time(SOL)	Time(EOL)	Hypack File	Isis File
1	180	0123	0400	001_0123.raw	001_0123.xtf
2	0	0415	0705	002_0415.raw	002_0415.xtf
3	180	0729	0955	003_0729.raw	003_0729.xtf

Noticed that the previous three lines contained no navigation. Side scan records existed but with no nav. Nav exists in Hypack files. Will somehow have to input Nav into the XTF files. The problem occurred presumably since Isis was running out of hard disk space again, so Billy inputted a new path for Isis to save the files, and Hypack didn't know where to "share the memory" to. Apparently Nick came on shift and switched the path back to its original location thereby alleviating the problem in the subsequent line files which did contain the nav data. Meanwhile a networking solution to the Windows 95 Isis box was discovered. Essentially had to have a the appropriate INF file for the network card emailed to the ship. The install then wanted a specific SYS file. We simply renamed another similar

SYS file to what the system was looking for, which worked. Now having a network connection, the first two days of data were transferred to the Habitat laptop for processing.

Line#	Azimuth	Time(SOL)	Time(EOL)	Hypack File	Isis File
4	0	1018	1246	004_1018.raw	004_1018.xtf

Level wind drive chain popped off again. Same scenario as before, with 300m cable deployed. Had to increase vessel speed in this line up to 12 knots while repaired the level wind.

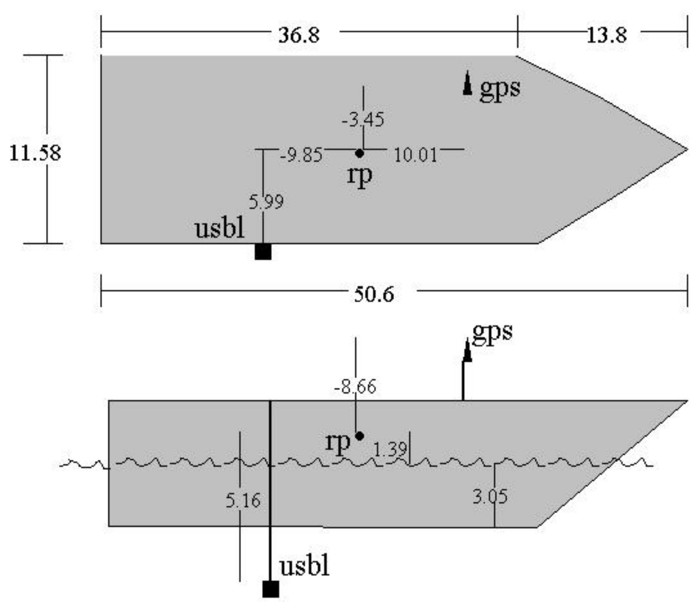
Line#	Azimuth	Time(SOL)	Time(EOL)	Hypack File	Isis File
5	180	1322	1550	005_1322.raw	005_1322.xtf
6	0	1610	1903	006_1610.raw	006.1610.xtf
7	180	1933	2210	007_1933.raw	007_1933.xtf
8	0	2226	0057	008_2226.raw	008_2226.xtf

Thursday, September 26th 2002-

Survey ended. Transit back to Port Angeles demobilizing en route, arriving at 0900. Unloaded ship and dropped off SSR crew at Fairchild International at 1030.

7.2 VESSEL CONFIGURATION PARAMETERS

Gyro error in vcf file = -16 to account for magnetic declination error.



7.3 DATA PROCESSING STEPS FOR CORRECTING MISSING NAVIGATION IN XTF FILES (CARIS)

Lines 001, 002, and 003 from the south set of lines were missing navigation data in the XTF. The following steps describe the procedure taken to remedy the situation:

1. Use Hypack single beam editor to extract navigation and time stamps for each *.raw file to an ascii text file.
2. Run "fixxtime.exe" to add a range of time stamp and number of pings for each file so that NavInXTF will recognize range of times for each XTF file.
3. Run NavInXTF utility to extract the trackpoint Nav (ship nav was already in file) and time stamps from the created ascii file to append into the existing XTF file. Set up ascii export options to use Definitions for hour, minute, second, easting, and northing.
4. Select the appropriate XTF file.
5. Select Sensor to replace the new navigation in the XTF file.
6. Convert the XTF files in Caris as usual using the conversion wizard. (Navigation won't convert because the time millisecond clock hasn't been replaced)
7. Use Caris Generic Data Parser to replace navigation from a Hypack *.raw file into the HDCS files. Select the "sss_mystery_bay.par" template that is created in the Hips/Session folder. Template date must be filled out similar to a Hypack file. Select Identifier and name it TND. Start position =1. Year= 20,4; month=14,2; day=17,2. Time stamps: select free form, field 3. Only check seconds with position 1, length 8 or 9 depending on data. Check Navigation, check identifier with name POS 0 (for dgps) – note POS 2 is for trackpoint. Select ground. Free form, field 5 for northing (1,11). Field 4 for easting (1, 10). Repeat steps for SSS Nav, only replace identifer with POS 2.
8. Click red arrow button. The familiar conversion will now appear. Select edit existing lines.
9. Select line to be appeneded. When wizard asks you to select file, navigate to the Hypack raw file with the new navigation instead of selecting an XTF file as you normally would. Continue with wizard as normal.
10. Nav is now replace.

7.4 SURVEY STAFF

Search, Salvage, and Rescue, Inc., a consulting firm based out of Stuart, Fl, was the primary survey contractor. SSR staff included Nicholas Perry, survey party chief; Jim Whitaker, project manager; and Dan Shayler, survey technician. As a subcontractor to SSR, Seafloor Systems, Inc, based in Hillsboro, OR, provided one additional survey technician, Bill Jakl. Steve Intelmann served as the overall project supervisor and OCNMS representative.

7.5 CARIS XTF CONVERSION PROCEDURE

XTF Conversion using cable out for towfish positioning

-Ship navigation from ship field
-SSS navigation from ship field
-gyro from sensor field
-channels 1,2 for 100 kHz low freq.
-channels 3,4 for 384 kHz high freq.
-check compute depth and layback from cable out
-after conversion to HDCS, process/recompute towfish navigation

XTF Conversion using trackpoint II usbl for towfish positioning

-Ship navigation from ship field
-SSS navigation from sensor field
-gyro from sensor field
-channels 1,2 for 100 kHz low freq.
-channels 3,4 for 384 kHz high freq.
-do **NOT** check compute depth and layback from cable out
-after conversion to HDCS, do **NOT** process/recompute towfish navigation

7.6 TEI XTF PROCESSING

Use ModXTF to swap the primary (Trackpoint II) navigation with the auxiliary (ship DGP), then run Fixheadx to smooth the heading (correct for the 16 degree error that was compensated for in the Caris VCF gyro offset). When mosaicing in Isis, use navigation from the coverage map, apply layback in mosaic, and choose heading from the heading field.

Mystery Bay 2002 Isis Processing Parameters--

Heading= use gyro with offset of 23 degrees
Lateral Offset = -3.4m
Layback Offset = 44m
mosaic resol. = 1m

Processed with BAC
Start at first return
Applied duration of 282m

TVG curves--
Line 1,3 (south block)
-7 +.109 +(-13)
Line 2 (south block)
-3 +.03 + (-4)
Line 4,5,6,6b,7,8
-6 + .109 + (-13)
**For line6b also put an across track angle of 4 degrees in the BAC compensation

For shallow water smaller range scale lines (East block)
TVG Curve (original)
-1.4 + 0.22 + (-2)
range =25m